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10 UNITED STATES DISTRICT COURT  
11 CENTRAL DISTRICT OF CALIFORNIA – WESTERN DIVISION  
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13 NEUROGRAFIX, a California  
14 corporation; WASHINGTON  
15 RESEARCH FOUNDATION, a not-for-  
16 profit Washington corporation,

17 Plaintiffs,

18 vs.

19 SIEMENS MEDICAL SOLUTIONS  
20 USA, INC., a Delaware corporation; and  
21 SIEMENS AKTIENGESELLSCHAFT, a  
22 German Corporation,

23 Defendants.  
24  
25  
26  
27  
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Case No. 10-CV-1990 MRP (RZx)

[Assigned to The Honorable Mariana  
R. Pfaelzer]

**EXPERT REPORT OF MICHAEL  
N. BRANT-ZAWADZKI, M.D.,  
F.A.C.R.**

First Amended Complaint Filed:  
July 30, 2010

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**EXPERT REPORT OF MICHAEL N. BRANT-ZAWADZKI, M.D., F.A.C.R.**

**I. SUMMARY OF OPINIONS**

1. This report sets forth my opinion regarding the limited remaining issues regarding the phrase "a conspicuity of 1.1 times that of [the]/[any adjacent] non-neural tissue" as used in the claims of U.S. Patent No. 5,560,360 (the "'360 patent"). In particular, it is my opinion that one having ordinary skill in the art at the time the patent was filed would have understood that the phrase meant "contrast (in, for example, intensity or color) of at least 1.1 times between the nerve and [the]/[any adjacent] non-neural tissue." Additionally, it is my opinion that a person having ordinary skill would have understood that the proper method to determine conspicuity was to use the ratio of average signal intensity from the nerve as identified by the observer over the average signal intensity of the surrounding non-neural tissue, as selected by the observer. The observer will identify the nerve and select the non-neural tissue based on their extensive training and experience as well as the disclosure of the '360 patent.

2. This report also addresses the question stated in the Court's May 5, 2011 Claim Construction Order regarding how an observer of ordinary skill in the art (in other words, a practicing radiologist) will know how to identify the nerve and background, and how to select the appropriate regions of interest in each to determine conspicuity according to the teaching of the '360 Patent. As I describe in detail below, radiologists are trained to identify and select appropriate structures in MR images. Indeed, it is a common place, if not an everyday, task for an average radiologist to identify and select relevant structures in an MR image. In my opinion, average radiologists would have no problem determining conspicuity relevant to the claims of the '360 patent in a consistent and repeatable manner and therefore be able to determine whether the claims of the '360 Patent are being practiced or not.

3. I base my opinion on the materials listed in Exhibit B to this report as well as the materials cited below. These materials include the '360 patent, including its prosecution history, the parties' previous claim construction briefs, the Court's Claim Construction Order and my 35 years of experience and knowledge as a diagnostic radiologist and neuroradiologist.

## II. INTRODUCTION

4. I have been asked to provide my opinion on two topics. First, I have been asked to provide my opinion regarding the meaning of "a conspicuity of 1.1 times that of [the]/[any adjacent] non-neural tissue" to a person of ordinary skill at the time the '360 patent was filed. Second, I have been asked to address the questions raised by the Court in its Claim Construction Order regarding how a skilled artisan (that is, a radiologist or neuroradiologist described below) in 1992 would 1) distinguish the nerve from the image background, and 2) select regions of interest in each in determining "conspicuity" as defined by the '360 patent.

## III. MY QUALIFICATIONS

5. I have been practicing medicine as a diagnostic radiologist for 35 years. A full listing of my qualification can be found in my CV, attached as Exhibit A to this report.

6. I am currently the Executive Medical Directory of the Neurosciences Institute at Hoag Memorial Hospital in Newport Beach, CA.

7. I have been board certified in Radiology since 1979 and Neuroradiology since 1995 (the first year board certification for Neuroradiology was offered). In my career, I have read over 100,000 MRI scans.

8. I attended medical school at the University of Cincinnati College of Medicine, where I graduated first in my class and was awarded the Stella F. Hoffheimer Award. After an internship in internal medicine at UC San Diego, I completed my residency in Diagnostic Radiology at Stanford University and

1 Medical Center. I also completed a 1-year fellowship in Neuroradiology at  
2 Stanford University and Medical Center.

3 9. After my fellowship, in 1980, I obtained a full time academic post as an  
4 Assistant Professor at UC San Francisco. During my first three years at UC San  
5 Francisco, I became involved with the Department of Radiology's imaging  
6 laboratory, where one of the first commercialized MRI instruments was being  
7 designed and developed. I became the neuroradiologist in charge of the  
8 development of clinical magnetic resonance imaging applications for the brain  
9 and the spinal region. I co-directed the MRI animal research laboratory at UC  
10 San Francisco's main academic hospital during this period as well. Our  
11 department generated a large number of original research articles, book chapters  
12 and books.

13 10. I have authored or co-authored over 180 peer reviewed articles in the  
14 medical literature, including some of the fundamental articles regarding MRI  
15 imaging of the central nervous system. I also wrote the first textbook on MRI  
16 imaging of the central nervous system ever published, and was a contributor to a  
17 large number of chapters and non-peer reviewed articles. I have also lectured  
18 throughout the world on the topic of MRI imaging of the central nervous system.

19 11. In recognition of my works, I was also awarded the Gold Medal from the  
20 Society of Magnetic Resonance in Medicine for my outstanding pioneering  
21 achievements in magnetic resonance imaging.

#### 22 IV. LEVEL OF ORDINARY SKILL

23 12. The '360 patent discloses a system and method for reliably imaging neural  
24 tissue for diagnostic and treatment purposes. *See, e.g., '360 patent at Abstract*  
25 *("generating **diagnostically** useful images of neural tissue" (emphasis added));*  
26 *'360 patent at 6:5-9 ("It would further be desirable to enhance the information*  
27 *content of the images, **diagnose** neural trauma and disorders, and inform and*  
28 *control the administration of **treatments and therapy.**" (emphasis added)). The*

claims are aimed at using MRI to determine the structure, position and status of nerves, a function uniquely performed by radiologists. See, e.g., '360 patent at Claims 1, 3, 7, 11, 12, 15, 16, 18 ("A method of utilizing magnetic resonance to determine the shape and position of mammal tissue..."). As a result, I agree with and support NeuroGrafix's previous position in the claim construction briefing that the proper level of ordinary skill is a medical doctor with an M.D., three years of residency and a 1 year fellowship in neuroradiology or musculoskeletal radiology and at least 2 years experience in neuroradiology or musculoskeletal radiology, or equivalent education and experience in neuroradiology or musculoskeletal radiology. A person having ordinary skill in the art will also have substantial experience (e.g., 2 years) in the design and physics of an MRI machine, the process regarding how images are generated with it, and its limitations.

13. Because the patent is aimed at using MRI for diagnostic purposes (in other words, using the MRI to identify and evaluate nerves in the body), I believe it is not sufficient for someone to be skilled in simply the physics or electronics of MRI, or other basic sciences of the medical curriculum. Rather, to be one of skill in the art, a person must have a medical degree and be trained at using the MRI to identify structures in the human body, and other clinical features of human pathology.

#### **V. THE MEANING OF "CONSPICUITY" TO A PERSON OF ORDINARY SKILL IN THE ART**

14. I have been informed and understand that claim construction is the process of determining the meaning of a term or phrase used in a patent claim to a person having ordinary skill in the art at the time the patent was filed. It is further my understanding that the most important sources to consider in claim construction are the patent itself and its prosecution history and the provisional applications to which it claims it is entitled to priority. This material is called the "intrinsic

evidence." I have also been informed and understand that the Court may also consider material such as dictionaries, articles and expert testimony. This material is called the "extrinsic evidence."

15. The full phrase addressed in the Court's Claim Construction Order is "a conspicuity of the nerve that is at least 1.1 times that of [the]/[any adjacent] non-neural tissue." Claim Construction Order at 12-15. For the sake of brevity, I will refer to this phrase as the "conspicuity" term.

16. While the concept of conspicuity is well known within the radiology field, the '360 patent expressly discloses the meaning of conspicuity for the expressed purpose of neurography. In particular, the '360 patent reads: "These neurograms exhibit a high nerve conspicuity, which for the purpose of the ensuing discussion will be understood to refer to the contrast (in, for example, intensity or color) between the nerve and image background." '360 patent at 11:56-59. The inventors also repeated this statement to the PTO in the file history of the '360 patent. See 11/14/94 Amendment at 11. A person of ordinary skill in the art at the time therefore would have understood that, in the context of the '360 patent, the term "conspicuity" refers to contrast.

17. The '360 patent also provides a specific formula for calculating contrast: "A nerve-to-muscle contrast parameter  $R$  of 2.43 was then computed as the ratio of  $S_n/S_m$ ." '360 patent at 22:42-43. The placeholder  $S$  as used in the equation for contrast refers to the "average image intensity." '360 patent at 14:64-65. Thus, a person of ordinary skill in the art at the time would have understood that contrast (and therefore conspicuity) is determined by taking the ratio of the average signal intensity of the nerve and the average signal intensity of the image background.

18. The patent teaches selecting a region of interest (ROI) and calculating the average image or pixel intensity for each ROI. '360 patent at 14:53-64. Thus, the patent teaches that conspicuity is determined by selecting a region of interest in



1 the nerve and a region of interest in the background tissue, and taking the ratio of  
2 the average signal intensities for the two regions of interest.

3 19. Dr. Tsuruda, one of the inventors of the '360 patent, has also agreed that the  
4 '360 patent discloses the ratio above to calculate conspicuity for use in the  
5 "conspicuity term." 2/25/11 Tsuruda Transcript at 176:25-177:11.

6 20. Therefore, it is my opinion that the meaning of the "conspicuity" term is  
7 "contrast (in, for example, intensity or color) of at least 1.1 times between the  
8 nerve and [the]/[any adjacent] non-neural tissue." Further, conspicuity is  
9 determined by taking the ratio of the average signal intensity of the nerve and the  
10 average signal intensity of the surrounding or adjacent non-neural tissue.

11 21. I also agree that a person of ordinary skill in the art would have understood  
12 at the time the '360 patent was filed that a conspicuity of at least 1.1 times will  
13 result where the nerve is at least 10% brighter than the surrounding or adjacent  
14 tissue. *See, e.g.*, '360 patent at 23:57-61 ("nerves are brighter than any other  
15 structure in the image. The extent of the increased nerve conspicuity is on the  
16 order of ten-fold, rendering the images clearly susceptible for use in constructing  
17 neurograms."); 6:44-45 ("the fully assembled complex sequence actually results  
18 in the nerve signal being more intense than any other tissue."). It is my  
19 understanding that Dr. Moseley, the expert Defendants relied on in their claim  
20 construction briefing, also did not dispute that the "conspicuity" term "means that  
21 something stands out from something else by 10 percent." 2/8/11 Moseley  
22 Transcript at 55:10-17.

23 **VI. THE IDENTIFICATION AND SELECTION OF NERVE AND**  
24 **BACKGROUND FOR THE DETERMINATION OF**  
25 **"CONSPICUITY"**

26 22. It is my understanding that the Court requested an explanation as to how a  
27 person of ordinary skill in the art identifies and selects the nerve and the non-  
28 neural tissue, and the regions of interest in each, when determining "conspicuity."



1 Claim Construction Order at 15:25-27. In particular, I understand that the Court  
2 has expressed concern that the identification and selection of the nerve and the  
3 background and regions of interest in each is so subjective that a person of  
4 ordinary skill in the art would not be able to determine when the claim was being  
5 infringed or not. Claim Construction Order at 14:26-15:28.

6 23. It is further my understanding that the Court's concern is related to the  
7 determination of whether the "conspicuity" term is indefinite. It has been  
8 explained to me, and I have read in the Court's Claim Construction Order, that a  
9 claim is indefinite where it does not inform a person of ordinary skill in the art of  
10 the bounds of the invention such that a person of ordinary skill in the art could  
11 avoid infringement.

12 24. In my opinion, as discussed in detail below, a person having ordinary skill  
13 in the art would understand the bounds of the "conspicuity" term because the  
14 identification and selection of a nerve and surrounding non-neural tissue and of  
15 regions of interest are commonplace and well-known tasks for radiologists.  
16 Radiologists applying their experience and knowledge in accordance with their  
17 duty and standard of care would reliably and repeatably be able to determine  
18 conspicuity as taught by the '360 patent, and determine whether the method was  
19 being practiced.

20 25. Radiologists have known the term "conspicuity" since the mid-1970s. *E.g.*,  
21 G. Revesz *et al.*, The Influence of Structured Noise on the Detection of  
22 Radiologic Abnormalities in *Investigative Radiology* Vol. 9 at 479-86  
23 (November-December 1974). In general, the term refers to distinctiveness of a  
24 particular structure in radiographic (image) data, such as an MR image.

25 26. Here, as described above, the '360 patent defines the "conspicuity" term as  
26 the nerve being ten percent brighter than surrounding (or adjacent) tissue. *See*,  
27 *e.g.*, '360 patent at 23:57-61 ("nerves are brighter than any other structure in the  
28 image. The extent of the increased nerve conspicuity is on the order of ten-fold,

1 rendering the images clearly susceptible for use in constructing neurograms.");  
2 6:44-45 ("the fully assembled complex sequence actually results in the nerve  
3 signal being more intense than any other tissue."). Dr. Moseley, Defendants'  
4 expert during claim construction, also agreed with this meaning for the  
5 "conspicuity" term. 2/8/11 Moseley Transcript at 55:10-17. Dr. Tsuruda also  
6 agreed with this meaning. 2/25/11 Tsuruda Transcript at 90:19-24.

7       **A. A Person Of Ordinary Skill In The Art Knows How To**  
8       **Identify A Nerve In Light Of The Teachings Of The '360**  
9       **Patent**

10 27. It is my understanding that the first concern raised by the Court was how a  
11 person of ordinary skill in the art can identify a nerve in an MR image. Claim  
12 Construction Order at 15.

13 28. A person of ordinary skill in the art at the time, in light of the teachings of  
14 the '360 patent, understands how to identify a nerve in an MR image. That  
15 identification is not so subjective that one of skill would not understand the clear  
16 bounds of the claims. As I will describe in more detail below, a person of  
17 ordinary skill will use one or more of the following techniques to identify a nerve:  
18 1) their extensive training and experience in identifying anatomy on MR images,  
19 including the expected location of nerves; 2) the presence of a fascicle pattern  
20 and/or 3) diffusion anisotropy and fat suppression.

21 29. As part of his or her training, a person of ordinary skill in the art (*e.g.*, a  
22 radiologist or neuroradiologist) received extensive instruction and training in  
23 gross anatomy, including the expected locations of anatomical structures  
24 including pattern and distribution of nerves. A person of ordinary skill would  
25 also have received extensive daily training, including hands-on training during  
26 residency and their fellowship, relating to reading MR images and identifying  
27 anatomical structures, including nerves.

1 30. Furthermore, Dr. Tsuruda, a radiologist and one of the inventors of the '360  
2 patent, also testified that radiologists can and do identify nerves on MR images.  
3 2/25/11 Tsuruda Transcript at 28:19-29:14; 182:24-183:22.

4 31. For many nerves, the training and expertise of a person of ordinary skill in  
5 gross anatomy is sufficient for identifying a nerve. This includes using the  
6 hundreds of images in a typical MR study to trace a structure through the  
7 anatomy and determine the nerve's relationship to neighboring structures.

8 32. For those nerves for which knowledge of gross anatomy is not enough, the  
9 '360 patent teaches at least two other ways to identify nerves. First, the '360  
10 patent teaches that a nerve can be identified by looking for fascicles. '360 patent  
11 at 27:4-28:26. In an MR image made using the '360 patent, fascicles appear as  
12 alternating bright and dark portions, similar to a checkerboard. Figures 20 and 21  
13 of the '360 patent provide a good example of a fascicle. As the '360 patent notes,  
14 identifying fascicles is useful because "blood vessels, lymphatics, lymph nodes  
15 and collections of adipose tissue," which can have similar shapes and locations to  
16 nerves, do not have fascicles. *Id.* at 27:57-65. Thus, the patent teaches that  
17 fascicle identification "may be used to distinguish nerve from other structures in  
18 an ambiguous image . . ." *Id.* at 27:65-28:26.

19 33. The '360 patent also teaches that, even where a nerve does not have the  
20 fascicle structure, the combination of diffusion weighting and fat suppression  
21 results in the nerve distinguishing itself from surrounding tissue. '360 patent at  
22 22:33-36 ("The combined use of fat suppression and diffusional weighting has,  
23 however, been found to be extremely effective in providing the desired nerve  
24 enhancement."). If the structure in question is not a nerve, the use of a pulse  
25 sequence with diffusion weighting and fat suppression will not be affected by the  
26 different diffusion gradients. Conversely, if the structure in question is a nerve,  
27 the structure will darken or brighten depending upon the direction of the gradient.  
28 Thus, the patent teaches that comparing images taken with and without diffusion

1 weighting and fat suppression can be used to distinguish nerve from non-nerve  
2 tissue.

3 34. The '360 patent also discloses how to distinguish nerves from blood  
4 vessels. Consistent with the knowledge of one of ordinary skill in the art, blood  
5 vessels in many situations show voids (black spots) that result from the flow of  
6 blood through the vessels. '360 patent at 3:45-54. Nerves do not exhibit these  
7 flow voids. *Id.* at 3:55-56 ("because peripheral nerve does not exhibit the flow-  
8 distinctiveness of blood vessels").

9 35. A person of ordinary skill will use one or more of these techniques to  
10 identify a nerve. In a typical study, a radiologist will ensure that a number of  
11 pulse sequences are used. For example, a radiologist will order a study that  
12 includes non-diffusion-weighted images and diffusion-weighted images with fat  
13 suppression. If the radiologist is unsure if a structure that is bright on the  
14 diffusion weighted study is a nerve, the radiologist will consult the non-diffusion-  
15 weighted images. If the structure is not bright on the non-diffusion-weighted  
16 images, the structure is probably a nerve. If it is also bright on the non-diffusion-  
17 weighted images, the structure was not affected by the diffusion weighting and is  
18 therefore not likely to be a nerve.

19 36. The selection and outline of diagnostically relevant structures in an MR  
20 image is an aspect of a radiologist's job and is a very common, if not an everyday,  
21 occurrence. For example, in my practice, I routinely select aneurysms using MR  
22 image-viewing software to determine their size. I also routinely select tumors in  
23 my patients' current and past scans to track whether the tumors are changing in  
24 size over time.

25 37. Similar to the selection of aneurysms and tumors, an average radiologist is  
26 able to use their extensive education and training to select a nerve for the purpose  
27 of determining conspicuity relevant to the claims of the '360 patent. For example,  
28 all radiologists, and especially neuroradiologists, have education and experience

1 regarding human neuroanatomy, including the location of individual nerves in the  
2 body. Beyond the specific courses in anatomy and neuroanatomy that all medical  
3 students are required to master, radiologists throughout their training are required  
4 to conduct correlations between normal as well as pathological anatomic  
5 specimens and imaging techniques. Neuroradiologists specifically study those  
6 correlations with the central and peripheral nervous systems. During residency,  
7 for example, radiologists are expected to do this on a daily basis. One of ordinary  
8 skill in the art of the '360 patent would have been able to use the built-in features  
9 of the existing MRI software to select a nerve for the purpose of determining  
10 conspicuity.

11 38. An average radiologist is also familiar with the selection of surrounding  
12 non-neural tissue. Distinguishing one type of tissue from another is part of the  
13 anatomic foundations for a radiologist's every day work. This occurs with every  
14 case a radiologist reads, typically 100 cases per day. For example, in an image  
15 where the nerve was surrounded by tissues with varying signal strengths (i.e.,  
16 some surrounding tissue is brighter than other surrounding tissue), an average  
17 radiologist would select the surrounding tissue with the strongest signal strength  
18 (brightest) to determine whether the conspicuity of the nerve is *at least* 1.1 times  
19 different from that of surrounding non-neural tissue. As another example, in an  
20 image where the nerve is surrounded by tissue with substantially uniform signal  
21 strength (i.e., the tissue appears to be a uniform color on an MR image), an  
22 average radiologist would select a representative portion of the surrounding  
23 tissue.

24 39. Furthermore, I also note that a nerve with the conspicuity required by  
25 claims 1 through 35 of the '360 patent will be very conspicuous to a person of  
26 ordinary skill (i.e., an average radiologist). See '360 patent at 6:2-5 ("The images  
27 generated should be sufficiently detailed and accurate to allow the location and  
28 condition of the individual peripheral nerves to be assessed."); 11/14/94

1 Amendment at 10-11 ("The prior art methods cannot provide the specified level  
2 of conspicuity for a peripheral nerve, one of the cranial nerves 3-12, or an  
3 autonomic nerve."). The techniques above are only necessary if the person of  
4 ordinary skill is unsure if the conspicuous structure is a nerve, such as may  
5 happen for the smaller peripheral nerves.

6 40. Thus, in my opinion, a person having ordinary skill in the art will have no  
7 trouble identifying a nerve in an MR image that shows a nerve with a conspicuity  
8 of at least 1.1 times that of the surrounding non-neural tissue.

9 **B. The Selection of Regions of Interest Is a Standard Practice**  
10 **For Radiologists and Is As Accurate As Is Possible to**  
11 **Specify for MRI.**

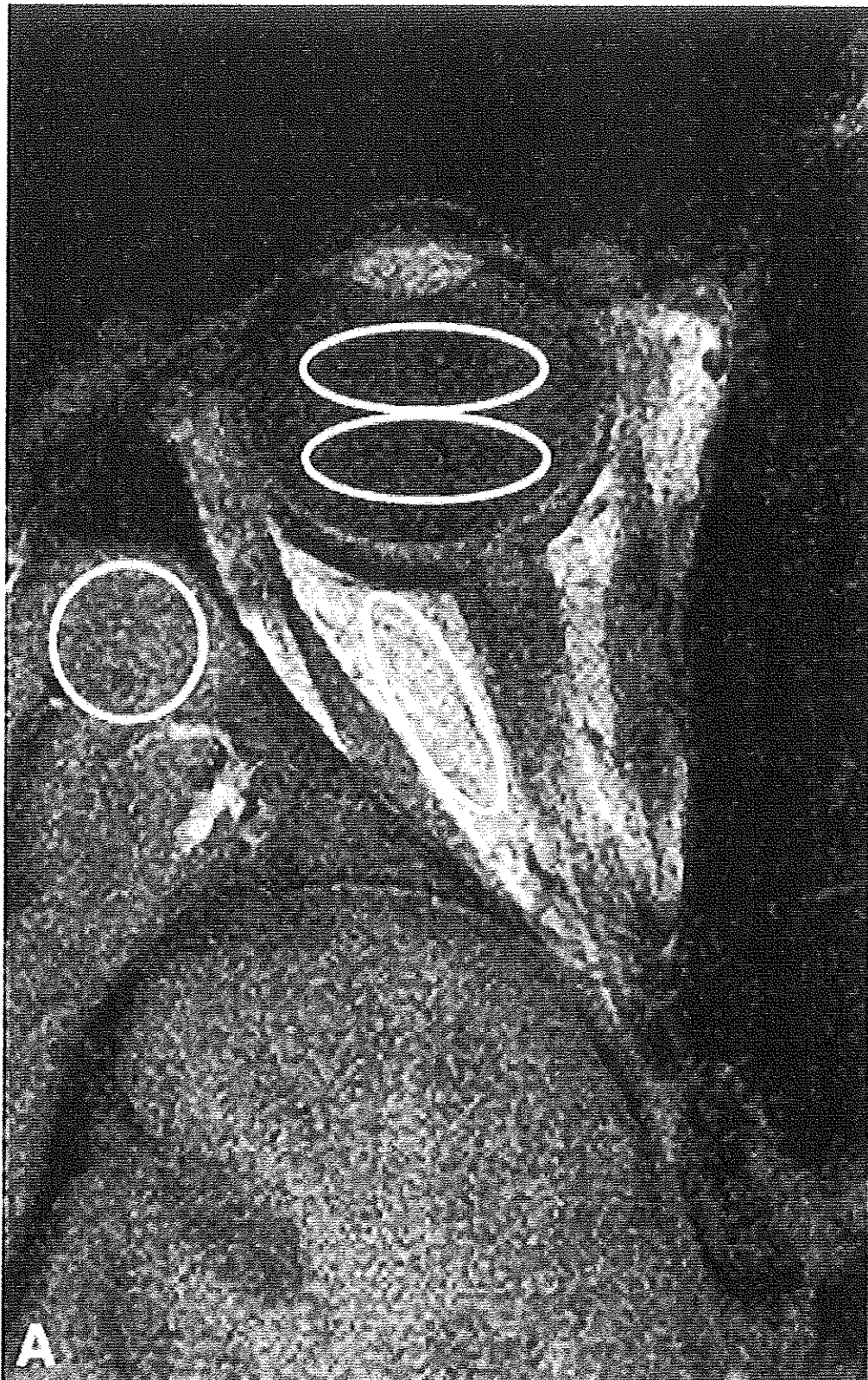
12 41. The patent teaches taking a region of interest of a nerve tissue and  
13 comparing the average signal intensity of that to the average signal intensity of  
14 the background tissue to determine if that ratio is greater than 1.1.

15 42. In selecting the appropriate regions of interest, a person of ordinary skill  
16 will also know what portion of the region of interest to choose. Radiologists are  
17 trained to take appropriate regions of interest for comparing two structures. They  
18 select the region so that it includes only the structure of interest. In other words,  
19 it will not include multiple structures, or go across structure boundaries.

20 43. For example, in a region of interest with consistent signal intensity, the  
21 person of interest knows to select a representative portion of the region. An  
22 example of this can be seen in Fig. 1a of E.A. Vorurka et al., Improved High  
23 Resolution MR Imaging for Surface Coils Using Automated Intensity Non-  
24 Uniformity Correction: Feasibility Study in the Orbit in *Journal of Magnetic*  
25 *Resonance Imaging* 14:540-546 (2001), which is reproduced below:  
26  
27  
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If the structure is less uniform, such as if the fascicle pattern in a nerve is visible, the person of ordinary skill in the art will select the entire structure. The claims themselves dictate this, because they require taking the average signal intensity of

1 the "nerve," not a portion of the nerve. Thus, the person of skill will know to take  
2 a ROI of that is representative of the nerve tissue. The person of ordinary skill  
3 will also seek to exclude voxels which they believe are not actually part of the  
4 structure. These errant voxels can occur as a result of many causes including  
5 noise in the data and partial volume averaging (where the voxel is actually  
6 representative of the average signal intensity of two adjacent structures). *See,*  
7 *e.g., G. Revesz et al., The Influence of Structured Noise on the Detection of*  
8 *Radiologic Abnormalities in Investigative Radiology* Vol. 9 at 479-86  
9 (November-December 1974); C.D.J. Sinclair *et al., MRI Shows Increased Sciatic*  
10 *Nerve Cross Sectional Area in Inherited and Inflammatory Neuropathies in J.*  
11 *Neurol. Neurosurg. Psychiatry* (2010).

12 44. The selection of the appropriate regions of interest is also governed by the  
13 average radiologist's duty of care to a patient. When selecting and outlining a  
14 nerve (or an aneurysm or tumor) to provide the best care for the patient, the  
15 radiologist would identify the nerve while excluding non-neural tissue. In the  
16 same manner, if an average radiologist is asked to determine whether the nerve  
17 has a conspicuity of at least 1.1 times as defined in the '360 patent, a radiologist  
18 would understand that the relevant background is the brightest surrounding tissue  
19 around the nerve. A person of ordinary skill in the art at the time would look at  
20 the brightest tissue around the nerve because by doing so, he or she could  
21 definitively determine whether the contrast between the nerve and surrounding  
22 tissue is *at least* 1.1 times. If the conspicuity of nerve relative to the brightest  
23 surrounding tissue is at least 1.1, then the conspicuity of the nerve relative to the  
24 other surrounding tissue will be even higher.

25 45. Dr. Tsuruda's testimony is also consistent with my opinion of how a person  
26 of ordinary skill will identify and select nerve and non-neural tissue. Dr. Tsuruda  
27 testified that conspicuity is a "standard technique in radiology imaging" and will  
28 be typically calculated by identifying a structure of interest and measuring the



1 difference in signal intensity between the structure of interest and an adjacent  
2 structure. 2/25/11 Tsuruda Transcript at 85:25-86:16. Dr. Tsuruda further  
3 testified that the calculation of the ratio of signal intensities is "objectively  
4 quantifiable." *Id.* at 186:20-24; *see also id.* at 86:3-13 (Dr. Tsuruda testifying that  
5 conspicuity is used in scientific papers because it is "fairly objective").

6 The Court cited to Dr. Moseley's testimony that the selection of the nerve and  
7 surrounding non-neural tissue is a subjective determination. For the reasons  
8 stated above, I disagree with Dr. Moseley's testimony. Dr. Moseley, who I  
9 understand is not a medical doctor and has no training as a radiologist or  
10 neuroradiologist, is mistaken as to how a person of ordinary skill in the art would  
11 perform the conspicuity determination. The claim language tells a person of  
12 ordinary skill to compare the average signal intensity of the nerve to the average  
13 signal intensity of the appropriate surrounding non-neural tissue. A person of  
14 ordinary skill in the art would not be confused as to whether to use the whole  
15 nerve or some subsection of the nerve, because the claim says to calculate the  
16 conspicuity of the "nerve." Similarly, when identifying the surrounding non-  
17 neural tissue, a person of ordinary skill knows to select the brightest of the  
18 appropriate surrounding non-neural tissue.

19 **C. One of Skill Can Determine Whether the Claim is Being**  
20 **Practiced Based on the Conspicuity Determination.**

21 46. In fact, there would likely be little variability in the identification and  
22 selection of the structures they are interested in. The repeatability of the  
23 identification and selection of regions of interest has been extensively studied in  
24 the literature. While the results of these thousands of studies vary based on a  
25 number of factors including the structure being selected, it has typically been  
26 found the inter-operator variability rate for human observers is approximately 5%.  
27 *E.g.*, V.N. Thijs *et al.*, Influence of Arterial Input Function on Hypoperfusion  
28 Volumes Measured With Perfusion-Weighted Imaging in *Stroke*, pp. 94-98

(January 2004); L.P. Clarke *et al.*, MRI: Stability of Three Supervised Segmentation Techniques in *Magnetic Resonance Imaging*, Vol. 11, pp. 95-106 (1993). It has actually been shown in the literature that the variability is substantially the same for inter-observer human selections and for selections done by a computer using pre-programmed criteria. *Id.*

47. Consistent with the literature, Dr. Moseley also testified that selection of regions of interest will have only a small variability. 2/8/11 Moseley Transcript at 132:14-133:2. Based on these studies and my experience, persons of ordinary skill in the art would repeatably and consistently determine whether an imaged nerve had a conspicuity of at least 1.1 times surrounding non-neural tissue because the location and structure of nerves in the human body is well-known, because radiologists have consistent education and training in identifying and determining conspicuity of nerves, and because the determination is whether the nerve is brighter than surrounding non-neural tissue by ten percent or more.

48. My understanding is that the claim is only indefinite if one of skill in the art would not be able to determine whether the claim limitation is met. Thus, it is not enough for Dr. Moseley to argue that the absolute value of conspicuity might vary slightly depending on the particular selection of the ROIs. (And, as noted above, the literature shows, such selection is very repeatable and consistent among radiologists). Thus, to show the claims to be indefinite, Dr. Moseley would have to provide evidence that the selection of ROI according to standard practices by a radiologist of ordinary skill in the art would affect whether the threshold of 1.1 is met. I am not aware that Siemens or Dr. Moseley has provided any such evidence. Moreover, I do not think that the small variability would have any significant bearing on the determination of whether the 1.1 threshold is met, because if a person of ordinary skill in the art practices the teachings of the '360 patent, the resulting data will show the nerve with much greater than a conspicuity of 1.1 times that of surrounding non-neural tissue. Based on my

1 knowledge and experience, when the teachings of the '360 patent are used in an  
2 imaging sequence, there will be no question to a person of ordinary skill in the art  
3 whether a resulting image meets the requirements of the "conspicuity" term  
4 because the nerve will be much greater than 1.1 times more conspicuous than  
5 surrounding tissue. While the absolute values of conspicuity may change slightly  
6 based on the actual boundaries of the regions of interest selected by a person of  
7 ordinary skill in the art, if the method is effective, the nerve will be much more  
8 than 10% brighter than the surrounding tissue. If the nerve is not much brighter  
9 in the resulting image, it likely means that the method failed (and they would not  
10 be practicing the "conspicuity" term).

11 49. Importantly, it is also my opinion that there is no more specific way within  
12 the art to describe the "conspicuity" term than the method used in the claims of  
13 the '360 patent. MRI uses ROIs (the basic unit of which is picture (volume)  
14 elements or "pixels" ("voxels")) and their measured signal intensities to  
15 characterize images and structures. Every MR image is different. Indeed, this is  
16 very reason that radiology is a specialty within medicine. Radiologists are  
17 extensively trained to understand how to understand and read MR images (and  
18 other types of images) despite their variability. As I discuss above, the  
19 identification and selection of nerve and non-neural tissue is a teachable, well-  
20 known, repeatable skill for radiologists.  
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1 I declare under penalty of perjury that the statements in this declaration are true  
2 and correct.  
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4 Signed on July 21, 2011 in Newport Beach, California.  
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6  
7 By: 

8 Michael N. Brant-Zawadzki, M.D., F.A.C.R.  
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# **EXHIBIT A**

# CURRICULUM VITAE

**Name:** Michael Nicholas Brant-Zawadzki, M.D., F.A.C.R

**Date of Birth:** December 2, 1949

**Citizenship:** USA

## Education:

<u>Dates Attended</u>	<u>Degree, Institution &amp; Location</u>	<u>Title or Status</u>	<u>Major Subject</u>
1967-1971	Stanford Univ., Stanford, CA	1971 B.A.	Biology
1971-1975	Univ. Cincinnati, Cin., OH	1975	M.D.
1975-1976	University Hospital, UCSD San Diego, CA	Intern	Internal Medicine
1976-1979	Stanford University Medical Ctr.	Resident	Diag. Radiology
1979-6/80	Stanford University Medical Ctr.	Fellow	Neuroradiology

## Licenses, Boards

1975	CA Medical License No. G31971
1979	Certified, American Board of Radiology
1995, 2005	Certified (CAQ), Neuroradiology, American Board of Radiology
2005-2006 (retired)	State of Tennessee, Telemedicine

## Current Positions

9/2007-Present	Hoag Memorial Hospital Newport Beach, CA	Executive Medical Director Neuroscience Center of Excellence
1990 - Present	Stanford University Stanford, CA	Adjunct Clinical Professor of Diagnostic Radiology

## Business Positions Held

1990-1995	Medical Director, Future Diagnostic Imaging, Inc. A California statewide preferred provider radiology network
1995-1996	President - California Managed Imaging Statewide radiology management service organization
1996-2001	Board of Directors-California Managed Imaging
1998-2007	Head, Advisory Board-ONI, Inc. (an MRI manufacturer)
2000-7/2002	Senior Vice President of Medical Affairs- CT Screening Int'l.
6/2005-2007	Board of Directors-Health Management Partners, LLC
2006-2007	Sr. Vice President, Amirsys Inc.

## Principal Positions Held Previously

2000-2007	Hoag Memorial Hospital Newport Beach, CA	Medical Director Radiology Department
1986-2007	Hoag Memorial Hospital Newport Beach, CA	Chairman/Vice-Chairman Radiology Department (Position alternates biannually)
1986-2007	Hoag Memorial Hospital Newport Beach, CA	Director of MRI
6/83-6/86	Univ. Calif. San Fran. School of Medicine	Associate Professor in Residence - Radiology, Neurology and Neurosurg. Co-Director, Magnetic

		Resonance Research Laboratory, Dept. of Radiology
7/80-6/83	Univ. Calif. San Fran. School of Medicine	Assistant Professor in Residence - Radiology
7/80-6/83	Univ. California San Francisco General Hosp.	Service Chief, Neuroradiology and Special Procedures Section
1979-1980	Stanford University Stanford, CA	Instructor in Radiology

**Concurrent Positions Held Previously**

1987-1990	Univ. Calif., San Francisco School of Medicine	Clinical Professor Department of Radiology
1988 - 1991	Loma Linda University	Clinical Professor of Radiology
1997- 2001	University of California Irvine	Clinical Professor of Radiology

**Ancillary Positions Held Previously**

6/82-3/85	Stanford University	Clinical Assistant Professor Department of Radiology
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**Honors and Awards**

1975	Stella F. Hoffheimer Award (1st in medical school graduating class)
1974-1975	Alpha Omega Alpha, 3rd and 4th years, University of Cincinnati College of Medicine
1973	Roche Award (Basic Sciences Prize), University of Cincinnati College of Medicine
1986	Memorial Award Paper - Association of University Radiologists (Senior Author)
1989	Fellowship, American College of Radiology
1993	Gold Medal, Society of Magnetic Resonance in Medicine, 7th recipient for outstanding pioneering achievements in magnetic resonance imaging
1996-2004	Selected as one of 100 best physicians in Orange County
1997	International Society for Magnetic Resonance in Medicine - Fellow of the Society
1997	American College of Radiology - Distinguished Commission Service Award
2005-2006	Best Doctors in America
2006-2007	Orange County Medical Association Physician of Excellence
2007-2008	Best Doctors in America
2008	JACR Best of 2008 Articles Award
2011	Southern California Super Doctors

**PROFESSIONAL ACTIVITY**

**Memberships in Professional Organizations**

1974-	Alpha Omega Alpha
1980-	American College of Radiology
1980-	Western Neuroradiologic Society
1981-	American Society of Neuroradiology
1982-	Radiologic Society of North America
1982-94	Society of Magnetic Resonance in Medicine
1984-86	Association of University Radiologists
1984-87	American Association for the Advancement of Science
1985-	American Medical Association
1987-	Orange County Radiological Society
1987-94	Society for Magnetic Resonance Imaging
1994-	International Society for Magnetic Resonance in Medicine
1994-	American Society of Spine Radiology
1994-	Society of NeuroInterventional Surgery
1995	Society of Interventional Radiology
1998-	American Heart Association
2007-	American College of Physician Executives

**Honorary Memberships**

1985	The Pacific Northwest Radiological Society
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1985	The Texas Radiological Society
1992	Chicago Radiological Society

**Professional Organization Activities**

1984	Western Neuroradiological Society	Program Committee
1984	American Society of Neuroradiology	Ad Hoc Com. on MRI
1984	American Society of Neuroradiology	Program Committee
1985	Western Neuroradiological Society	Audit Committee Chairman
1986	American Society of Neuroradiology	Subcommittee on MRI Chairman
1987	American Society of Neuroradiology	Research Overview Committee
1987-88	American College of Radiology	MR Committee
1989-91	Society of Magnetic Resonance Imaging	Board Member Board of Directors
1989-91	American College of Radiology	MR Committee
1991-95	American College of Radiology	Commission on Neuro- radiology and MR
1991-96	American College of Radiology	Committee on Gov't Relations of the Commission on Neuroradiology and MR
1991-96	American College of Radiology	Committee on Human Resources of the Commission on Neuroradiology and MR
1990-91	Western Neuroradiological Society	Secretary-Treasurer
1991-92	Western Neuroradiological Society	President-Elect
1992-93	Western Neuroradiological Society	President
1991-92	Society of MR in Medicine	Executive Committee Board of Trustees
1992-93	California Medical Association	Scientific Advisory Panel on Radiology
1993-94	American Society of Neuroradiology	Executive Committee Chairman - Rules Committee
1994-95	American Society of Neuroradiology	Executive Committee Member at Large
1996	American Board of Radiology	Examiner Neuroradiology CAQ exam
1996	Internat'l Soc for Magnetic Resonance in Medicine	Treasurer
1996	North American Spine Society	Task Force on Clinical Guidelines

1997	Radiological Society of North America	Health Policy and Practice Committee
1997	American College of Radiology Neuroradiology and MR	Government and Public Relations of the Commission on
1997	American College of Radiology	Human Resources of the Commission on Neuroradiology and MR
1997	North American Spine Society	Spinal Imaging Task Force, Committee on Practice Guidelines
1997-98	Internat'l Soc for Magnetic Resonance in Medicine	Treasurer and Chairman, Finance Committee
1997-98	American College of Radiology Neuroradiology and M.R.	Government and Public Relations of the Commission on
1997-00	American College of Radiology	Committee on Managed Care of the Commission on Economics
1998-Present	Cardiovascular Radiology Council	Board Member
1999	Radiological Society of North America	Health Services, Policy and Research Subcommittee
2002	Radiological Society of North America	Program Committee
2002	American Society of Neuroradiology	Program Committee
2003	Radiological Society of North America	Vice Chairman Public Information Committee
2003	Radiological Society of North America	Outreach Subcommittee
2003	American College of Radiology	Screening Technologies Task Force
2004	Radiological Society of North America	Neuroradiology/Head & Neck Subcommittee
2004-2006	Radiological Society of North America	Chairman Public Information Committee
2011	Radiological Society of North America	First Vice President
2011	American College of Radiology	Chairman Accountable Care Organization

**Service to Professional Publications**

Neuroradiology (1986-1992)	Editorial Board
Radiology Today	Editorial Board
Journal of Health Care Technology	Editorial Board
Radiology Report	Editorial Board
MRI Decisions	Editorial Board
American Journal of Neuroradiology	Editorial Board
JAMA, American Journal of Radiology	Reviewer
Journal of MRI	Editorial Board
Radiology (1985-1990)	Associate Editor
MAGMA	Editorial Board
Magnetic Resonance Quarterly (1994)	Co-Editor-in-Chief

Topics in Magnetic Resonance Imaging (1996-1998)	Editor
Stroke	Reviewer
Radiology	Reviewer
Journal of the American Medical Association (1996)	Reviewer
American Journal of Neuroradiology (1997-8)	Associate Editor
Seminars in Ultrasound CT and MRI (2003)	Guest Editor
Journal American College of Radiology	Associate Editor
Investigative Radiology	Reviewer

#### **Hospital and Community Service**

1986 -1992	Established annual post-graduate course "Symposium on Magnetic Resonance Imaging
1987 -	Founded and established Harbor Radiology Research and Educational Fund (\$250,000 non-profit foundation)
1987-93	Critical Care Committee
1988-93	Continuing Education Committee
1989-91	Acting Director, Hoag Neurological Institute
1991-2002	Executive Committee, Hoag Hospital
1995-Present	Medical Care Improvement Committee, Hoag Hospital
1999-Present	Stroke Pathway Team, Hoag Hospital
1999-Present	Cardiovascular Services Committee, Hoag Hospital
1999-Present	Bylaws Committee, Hoag Hospital
1999-Present	Medical Information Committee
2002-2009	Credentials Committee, Hoag Hospital

#### **SCIENTIFIC AND PROFESSIONAL MEETINGS AND WORKSHOPS ATTENDED**

International, national, and regional: see PAPERS PRESENTED section

INVITED LECTURES, PRESENTATIONS not listed previously

#### **Papers Presented**

<b>1978</b>	National professional societies, 2 presentations. National VA Television Network, guest discussant.
<b>1979</b>	National professional society, 1 presentation.
<b>1980</b>	National professional society, 2 presentations. 4th Annual National Symposium on Aging, UCSF, guest discussant.
<b>1981</b>	Professional societies, 2 presentations. Professional society courses, 7 lectures.
<b>1982</b>	<u>International symposia</u> : Toulouse, France, 1 presentation <u>National professional societies</u> : Boston, MA, 2 presentations; Chicago, IL, 2 presentations. <u>Postgraduate courses</u> : UCSF, 5 lectures; Stanford, 1 lecture; Salt Lake City, 1 lecture. <u>Regional professional societies</u> : 3 presentations.
<b>1983</b>	<u>International symposia</u> : NMR course, London, England; International Congress of Computed Tomography and NMR, San Francisco, 4 presentations; Society of Magnetic Resonance in Medicine, San Francisco, 1 poster, 1 presentation; Basic NMR Course, Dubrovnik, Yugoslavia, 2 presentations; Radiol Society of North America, 1 refresher course. <u>National professional societies</u> : Roentgen Ray Society, Atlanta, GA, NMR Refresher Course, 1 presentation; American Society of Neuroradiology, San Francisco, 1 presentation; Western Neuroradiological Society, invited lecture; American Academy of Pediatrics, San Francisco, 1 presentation; Western Angiography Society, Berkeley, 2 presentations. <u>Postgraduate courses</u> : Tampa, FL, 3 lectures; Hawaii, 2 lectures; Advances in Digital Radiography, Chicago, IL, 1 lecture; NMR Seminar, UCSD; Radiology of Trauma course, UC Irvine, Faculty; Digital Angiography Symposium, Chicago, IL, 3 presentations.



- 1984**      International symposia: Roentgen Revisited, Germany/Austria, 5 presentations;  
Society of Magnetic Resonance in Medicine, York, 2 presentations, 1 invited presentation;  
Royal Australasian College of Radiologists, Canberra, Australia, 5 presentations;  
Radiological Society of North America, 1 refresher course.  
National professional societies: Federation of Western Societies of Neurological Science, Napa, CA, 1 presentation  
American Association of Neurological Surgeons, San Francisco, CA, 1 presentation;  
American Roentgen Ray Society, Las Vegas, NV, 1 presentation; Association of University Radiologists, Newport Beach, CA, 1 presentation; American Society of Neuroradiology, Boston, MA, 1 presentation;  
American Neurological Association, Baltimore, MD, 1 presentation. Postgraduate courses: American College of Medical Imaging, Los Angeles, CA, 3 presentations, UCSF, 8 lectures;  
University of Wisconsin refresher course, Chicago, Illinois, 3 presentations; Harvard Postgraduate course, Boston, Massachusetts, 2 presentations;  
UC San Diego, San Diego, CA 3 presentations.  
Visiting professorship: Montefiore Hospital, Albert Einstein School of Medicine, Bronx, NY, 1 presentation.  
Regional professional societies: 5 presentations.
- 1985**      International symposia: Radiological Society of North America, Chicago, Refresher Course Speaker; Society of Magnetic Resonance in Medicine, London, Invited Speaker; Society of Magnetic Resonance Imaging, San Diego, CA, 2 presentations.  
Postgraduate courses: UCSF, 6 lectures.  
Regional professional societies: Portland Vascular Society, 1 presentation; Los Angeles Radiological Society, 3 workshops.  
Texas Radiological Society, El Paso, TX, 2 presentations;  
Washington Imaging Conference, Alexandria, VA, 1 presentation;  
Pacific Northwest Radiological Society, Portland, OR, 1 presentation.  
National professional societies: American Heart Association, 1 presentation;  
American Society of Neuroradiology, New Orleans, LA, 2 presentations; Magnetic Resonance Imaging Contemporary Forums, San Diego, CA, 2 presentations;  
American Roentgen Ray Society, Boston, MA, 1 course.  
Visiting professorship: D.C. American College of Radiology, George Washington University, Washington, D.C.
- 1986**      International symposia: Carvat, Rome, Italy - 3 presentations;  
Society Magnetic Resonance, Montreal Moderator.  
Post Graduate Courses: UCSF Dept. of Radiology January Course - 3 presentations. March Course - 1 presentation. MRI Course - 3 presentations.  
National professional societies: American Society of Neuroradiology, San Diego, CA, - 2 presentations. American Neurological Association - Guest Speaker. Radiological Society of North America - Refresher Course, Speaker; Chicago.
- 1987**      International Symposia: Soc. of Mag. Resonance Imaging, San Antonio, Texas - 1 presentation. Radiologic Society of North America - Categorical Course Faculty.  
Postgraduate Courses: UCSF Department of Radiology. Neuroradiology Course - 3 presentations. Cedars-Sinai Medical Center (Los Angeles) - MRI Course, 1 presentation.  
Barrows Neurol. Institute, Phoenix, Ariz. - Magnetic Resonance Imaging Symposium - 3 presentations. U.C. San Diego Postgrad. Course on Magnetic Resonance Imaging - 3 presentations. Loma Linda University Postgrad. Course - 2 presentations.  
National Professional Societies: American Academy of Neurology, New York - 2 presentations. 1st Annual Symposium on Magnetic Resonance Imaging, Ritz-Carlton, Laguna Niguel, CA - 2 presentations.
- 1988**      International symposia Riyadh, Saudi Arabia - 2 presentations Magnetic Resonance Imaging in Paradise: Update 1988, Tahiti - 3 presentations  
Postgraduate courses U. C. San Diego School of Medicine, Course of MRI - 2 presentations  
University of South Florida, College of Medicine, - 1 presentation  
University of New Mexico School of Medicine, Center for Non-Invasive Diagnosis, Short Course in MR 1 presentation  
4th Annual Imaging Seminar, University of Vermont, Department of Radiology - 3 presentations

University of Michigan, University Hospitals, Grand Rounds. Resident Noon Conferences - 2 presentations  
1988 Harvard Postgraduate Course, Harvard Medical School, Department of Continuing Education, Massachusetts - 2 presentations  
UCSF MRI Visiting Fellowship Faculty - 1 presentation  
National professional societies 40th Annual Midwinter Radiological Conference, Los Angeles - 1 Presentation  
American Roentgen X-ray Society, 88th Annual Meeting, San Francisco - 1 presentation 7th Annual Scientific Meeting and Exhibition - The Society of Magnetic Resonance in Medicine, San Francisco, CA - 2 presentations  
1988 Annual Convention of the American College of Osteopathic Radiology, Las Vegas, NV - 2 presentations  
Snowmass - 1988, MR & CT of the Head and Spine, Colorado - 4 presentations  
2nd Annual Symposium on Magnetic Resonance Imaging, Ritz-Carlton, Laguna Niguel, CA - 2 presentations  
6th Conference of Magnetic Resonance Imaging, Los Angeles Huntington Memorial Hospital and Diagnostic Imaging - 3 presentations  
Regional professional societies Orange County Academy of Internal Medicine, California - 1 presentation  
Los Angeles Radiological Society, Continuing Education Committee, Midwinter Radiological Conference, Universal City, California - 3 presentations  
Kaiser Permanente Medical Center - Radiology Symposium, Los Angeles - 2 presentations  
Dominican Santa Cruz Hospital, Dominican Neurologic Institute 13th Annual Neurosciences Symposium, California - 2 presentations

**1989** International symposia Tissue Characterization in MR Imaging - Wiesbaden, Germany - 1 presentation - 4/89.  
Magnetic Resonance Imaging: International Symposium in Venice and Florence, Italy - 5 presentations - 5/89.  
Magnetic Resonance Imaging - Eighth Magnetic Resonance Imaging (sponsored by Diagnostic Imaging) - Los Angeles - 4 presentations - 4/13/89  
Magnetic Resonance Imaging: Second Annual International Course, Riyadh, Saudi Arabia - 4 presentations - 10/2/89  
Postgraduate courses UC San Diego School of Medicine - Neuroradiology Update - 2 presentations - 1/23/89  
Medical College of Wisconsin - Intermountain Imaging Conference - Utah - 5 presentations - 2/28/89  
UCSF Neuroradiology Visiting Fellowship - 10/23/89  
Neuroradiology Harvard Post-Graduate Course - 1 presentation 9/18/89  
National professional societies Society for Magnetic Resonance Imaging - Educational Program of the 1989 Annual Meeting - Los Angeles - 1 presentation 2/25/89  
American Society of Neuroradiology - Categorical Course and 27th Annual Meeting, Orlando, Florida - 1 presentation 3/18/89  
Regional professional societies Hospital of the Good Samaritan - Practical Applications of MRI - 3 presentations - 1/18/89  
Los Angeles Radiological Society - Midwinter Radiological Conference - 3 presentations - 1/27/89  
Florida Radiological Society - Snowmass 1989: MR and CT of the Head and Spine - 3 presentations - 2/11/89  
Los Angeles Radiological Society - General Membership Meeting - 1 presentation - 6/14/89  
Western Society of Neuroradiology Symposium - Carmel - 2 presentations - 10/12/89 Los Angeles  
Radiologic Society Weekend MRI Seminar, Los Angeles - 4 presentations - 9/23/89  
Radiology Symposium, Kaiser Permanente - Los Angeles - 2 presentations - 11/4/89

**1990** International symposia  
Radiologic Society of North America, Chicago, IL - 3 presentations - 11/24/90  
Postgraduate courses  
Harvard Postgraduate Course - Boston, MA - 3 presentations - 5/23/90  
Harvard Postgraduate Course - Boston, MA - 3 presentations - 10/1/90  
National professional societies  
University of Hawaii at Manoa - MRI Workshop - 1 presentation - 4/8/90  
10th Conference on Magnetic Resonance Imaging - Diagnostic Imaging - San Diego, CA - 4 presentations - 4/4/90  
4th Annual Conference, Magnetic Resonance Imaging - Barrow Neurological Institute - Arizona - 3 presentations - 3/3/90

Ninth Annual Meeting of the Society of Magnetic Resonance in Medicine - New York, NY - 1 presentation - 8/18/90

Regional professional societies

Greater Kansas City Radiological Society - 2 presentations - 3/7/90

Kaiser Permanente - 1st Annual Neurosurgery Symposium - Costa Mesa, CA - 1 presentation - 1/20/90

5th Annual Palm Beach Magnetic Resonance Imaging Update - Florida - 3 presentations - 2/18/90

4th Annual Symposium on Magnetic Resonance Imaging, Laguna Niguel, CA - 4 presentations - 7/23/90

1990 Annual Scientific Meeting - Western Neuroradiological Society - Santa Fe, New Mexico - 1 presentation - 10/18/90

**1991**

International symposia

MRI Update - Madrid, Spain - June 24-26

Society of Magnetic Resonance in Medicine - Teaching Program - San Francisco, CA - August 10-11

Radiologic Society of North America - Refresher Course - Chicago - December 1-6

Postgraduate courses

University of California San Diego, Magnetic Resonance Imaging Course, San Diego, CA - 2 presentations - March 5

Breckenridge 1991: MRI in Clinical Practice - Breckenridge, CO - 4 presentations - March 9-16

3rd Annual Snowmass 1991: Practical Magnetic Resonance Imaging, Snowmass, CO - 2 presentations - March 16-23

12th Annual Intermountain Imaging Conference - Steamboat Springs, Colorado - 6 presentations - February 10-15

Harvard Medical School - Clinical MRI: 1991 Update - Cambridge, MA - June 5-8

Neuroradiology in the Rockies - Snowmass, CO - July 7-12

Harvard Postgraduate Course on Basic and Current Concepts in Neuroradiology, Head and Neck Radiology and Neuro-MRI - Boston, MA - September 23-27

Rush-Presbyterian MRI Course - Chicago - October 24 - 3 presentations

National professional societies

Society for Magnetic Resonance in Imaging, Chicago, IL - 2 presentations - April 13-15

Society of Magnetic Resonance in Medicine - Workshop - Napa, CA - May 23-25

Regional professional societies

Los Angeles Radiological Society - 43rd Annual Midwinter Conference - Los Angeles, CA - 6 presentations - February 1-3

Pacific Northwest Radiology Society - Portland, Oregon - 2 presentations - May 3-5

North Bay MRI Tutorials - Fairfield, CA - 3 presentations - April 29-May 3

Hawaii Radiological Society - 8th Annual Mtg - Hawaii - May 25-27

Florida Radiological Society - Practical Magnetic Resonance Imaging 1991 - October 17-20

**1992**

International symposia

SMRM Scientific Meeting and Exhibition - Berlin, Germany - 1 presentation - August 8-14

Postgraduate courses

14th Conference on MRI - Hawaii - January 8-11

Seminars in MRI - Sponsored by Medical College of Wisconsin - Vail, Colorado - 4 presentations - January 18-25

Florida Radiological Society - Breckenridge 1992 - Clinical MRI - 3 presentations - March 7-14

Snowmass 1992: Practical Magnetic Resonance Imaging - 3 presentations - March 14-21

Magnetic Resonance Imaging 1992: National Symposium - Las Vegas, CA - May 17-20

MRI in Spain and Morocco - 3 presentations - June 28-July 1

1992 Harvard Medical School Postgraduate Course in Neuroradiology, Head and Neck, and Neuro MRI - Boston, MA - 1 presentation - September 21-25

19th Ann. Radiology Symposium- Garden Grove, CA - 1 presentation - October 17

National professional societies

Society for Magnetic Resonance Imaging - 10th Annual Meeting - 1 presentation - April 25-29

American Roentgen Ray Society - Categorical Course - 1 presentation - May 10-15

American Society of Neuroradiology - St. Louis, MO - 1 presentation - June 3-4

Regional professional societies

Los Angeles Radiological Society - 44th Annual Midwinter Radiological Conference - Los Angeles - 6 presentations - January 31-February 2

Portland Vascular Society - 1 presentation - February 4

Chicago Radiological Society - Chicago, Illinois - 1 presentation - February 20

Stanford University School of Medicine - Grand Rounds - February 12

**1993**

Postgraduate courses

Stanford Neuroradiology Update - Laguna Niguel, CA - 4 presentations - January 18-20  
4th Annual Neurosurgery Symposium - Kaiser Permanente - 1 presentation - February 13  
Steamboat 1993: 3rd Annual MRI in Clinical Practice by the Florida Radiological Society - Steamboat Springs, CO - 5 presentations - March 6-13.  
National Neuroradiology & Pediatric Radiology Review Course: 1993 A Comprehensive Tutorial - Laguna Niguel, CA - 3 presentations - July 28 - 30

National professional societies

Society for Magnetic Resonance Imaging 11th Annual Meeting - San Francisco, CA - 1 presentation - March 27-31

The Society of Magnetic Resonance in Medicine 12th Annual Scientific Meeting and Exhibition - New York, NY - 1 presentation - August 19

American Society of Neuroradiology 1993 Annual Meeting - Vancouver, B.C. - 1 presentation - May 17

Regional professional societies

Los Angeles Radiological Society - 45th Annual Midwinter Radiological Conference - Los Angeles 2 presentations - January 16-January 17

California Medical Association - Annual Session and Western Scientific Assembly - Anaheim, California - February 28

Society of Magnetic Resonance in Medicine 1993 Annual Meeting - 1 presentation - August 19

Visiting professorship

The University of Utah, Salt Lake City, Utah - December 13-14

**1994**

International symposia

Society for Magnetic Resonance Imaging - 12th Annual Meeting - Dallas, Texas - 1 presentation - March 5

University Hospital of Zurich - Radiology in St. Moritz - St. Moritz, Switzerland - 7 presentations - September 11-18

Riyadh Armed Forces Hospital - The Fourth International MRI Course - Kingdom of Saudi Arabia - 3 presentations - October 2-5

Society of Magnetic Resonance - Second Meeting of the SMR - San Francisco, CA - 1 presentation - August 6-7

Postgraduate courses

Stanford Neuroradiology Update - Laguna Niguel, CA - 4 presentations - January 17-19

University of California San Diego School of Medicine - Postgraduate Magnetic Resonance Imaging Course - San Diego, CA - 3 presentations - February 15

Florida Radiology Radiological Society, Inc - 4th Annual Breckenridge MRI in Clinical Practice - Breckenridge, Colorado - 3 presentations - February 19-26.

University of California, San Diego School of Medicine - Musculoskeletal MR Course - Carlsbad, California - 4 presentations - March 21-25

Johns Hopkins Medical Institution - Principles & Practice of Clinical Magnetic Resonance Imaging - 4 presentations - April 21-24

University of South Florida College of Medicine - 4th Annual Clinical Neuroimaging Plus Seminar - Key West, Florida - 3 presentations - April 20-23

Hoag Memorial Hospital/University of California Irvine - National Neuroradiology & Musculoskeletal Radiology Review Course: 1994 - A Comprehensive Tutorial - Laguna Niguel, CA - 5 presentations - July 24-29

National professional societies

32nd Annual Meeting - American Society of Neuroradiology - Nashville, Tennessee - 2 presentations May 3-7

Radiological Society of North America - Chicago, Illinois - 1 presentation - November 27-December 2

Regional professional societies

Phoenix MR Society - Phoenix, AZ - 1 presentation - January 26

Los Angeles Radiological Society - Los Angeles, CA - 3 presentations - January 28-29

California Radiological Society - Annual Meeting, San Diego, California - 1 presentation - May 20

Memphis Roentgen Society - 2nd Annual Memphis Radiology Meeting - Memphis, Tennessee - 3 presentations - May 28-29

Western Neuroradiological Society - 26th Annual Meeting - Tucson, Arizona - October 6-9, 1994

Los Angeles Society of Neurological Sciences - Los Angeles, California - 1 presentation - Nov 16

Visiting professorships

Department of Radiology - Cornell University Medical Center, New York - November 10-11.

**1995**

International symposia

Postgraduate courses

Loyola University Chicago - Seminars in MRI - Vail, Colorado - 7 presentations - January 21-28  
MR and CT of the Head and Spine - Snowmass, Colorado - 4 presentations - February 11-18  
Massachusetts General Hospital and Harvard Medical School - MRI 1995: Clinical Update and  
Advanced Applications - Maui, Hawaii - 3 presentations - February 26- March 3  
University of South Florida - Key West, Florida - 5th Annual Clinical Neuroimaging Plus - 2  
presentations - May 10-13  
Stanford Neuroimaging Course - Laguna Niguel, CA - 3 presentations - August 13-16  
University of Utah - Salt Lake City - Intensive Interactive Head and Neck Imaging - October 26-29

National professional societies

American Society of Neuroradiology, 33rd Annual Meeting - Chicago, Illinois - 1 presentation -  
April 23-27  
American College of Radiology, Intersociety Commission Summit Meeting - Colorado Springs,  
Colorado - Moderator - July 27-31  
Radiological Society of North America - Chicago, Illinois - 2 presentations - November 25-29

Regional professional societies

Los Angeles Radiological Society - Los Angeles, CA - 4 presentations - February 3-5  
Western Neuroradiological Society - Victoria, Canada - 2 presentations - October 5-8  
San Diego Radiological Society - San Diego - 1 presentation - December 6

1996

International symposia

International Society for MR in Medicine - New York City - 3 presentations - April 26-May 3  
Radiological Society of North America, Chicago, Illinois - 1 presentation - Nov 29 - Dec 3

Postgraduate courses

Loyola University Chicago - Snowbird, UT - Diagnostic Imaging Compendium - 6 presentations -  
February 10-17  
University of California San Francisco - Aspen, CO - MRI: Update 1996 - 4 presentations - March 4-8  
University of Washington - Hawaii - Masters Radiology Conference - March 11-15  
Harvard Medical School/Beth Israel Hospital - MRI 1996: Clinical Update and Advanced Applications -  
Hawaii 4 presentations - April 9-13  
UC San Diego - Coronado, CA - Advanced Imaging of the Spine - 3 presentations - July 23  
University of Minnesota - Minneapolis, MN - 59th Course, Radiology 1996, Neuroradiology,  
Musculoskeletal Radiology, Mammography - 3 presentations - September 11-15

National professional societies

American Society of Neuroradiology, 34th Annual Meeting - Seattle, Washington - 1 presentation -  
June 21-27  
North American Spine Society - 11th Annual Meeting - Vancouver - 1 presentation - October 24

Regional professional societies

Los Angeles Radiological Society - Los Angeles, CA - 4 presentations - January 19-21

Visiting professorships

Department of Radiology, Cleveland Clinic - October 22-23

1997

International symposia

International Society of Magnetic Resonance, Vancouver BC, Invited lecturer, April 12-18.

Postgraduate courses

Jackson Hole Radiology Ski Conference, Jackson Hole, WY - 1 presentation, January 19-22.  
8th Annual Neurosurgery Symposium, Kaiser Permanente, Long Beach, CA - 1 presentation, February  
1.  
Loyola University Medical Center, Diagnostic Imaging Compendium, Vail, CO - 3 presentations,  
January 25-February 1  
The University of British Columbia, Sun Valley Imaging, Sun Valley, ID - 4 presentations, February 25-  
28  
MRI in Clinical Practice, Snowmass, CO - 3 presentations, March 2-7.  
Second International Symposium on Musculoskeletal MRI, San Francisco, CA - 3 presentations, June  
1-5  
University of Utah School of Med, Neuroradiology & Advanced MR, New Mexico, 8 presentations - July  
6-11  
UC Irvine Medical Center, Neuroradiology Review, Newport Beach, CA, Aug 31 - Sept 4  
UC San Francisco, Clinical Magnetic Resonance Imaging, San Francisco, CA - 2 presentations - Oct 6  
-10.

National professional societies

Regional professional societies

Los Angeles Radiological Society, Los Angeles, CA - 1 presentation - January 18



San Diego Radiological Society, San Diego, CA – 1 presentation – December 10.

Visiting professorships

Stanford University Medical Center, CA, Grand Rounds, 4/24

Partnering and Contracting for Radiology Services Conference, San Diego, CA - 1 presentation, November 18.

**1998**

International symposia

International Society of Magnetic Resonance, Sydney, Australia, Invited lecturer, April 18-24.

Radiological Society of North America, Chicago, IL – 1 presentation, November 29.

Postgraduate Courses

MRI Clinical Update and Advanced Applications, Kauai, HI – 3 presentations, February 14-21.

Advances in Imaging: 1998, Park City, UT. – 5 presentations, February 22-27.

Clinical Essentials of MRI, Las Vegas, NV – 2 presentations, June 11-12.

Clinical MRI, UCSF – 3 presentations, October 19-23.

Frontiers in Vascular Disease '98, Pebble Beach, CA – 1 presentation, October 15-18.

Neuroradiology for the Practicing Radiologist, Santa Fe, NM – 3 presentations, October 12-15.

Advanced Endovascular Demonstrations, Newport Beach, CA – 1 presentation, October 26.

Neuroradiology Review UCI, Irvine, CA – 4 presentations, October 31.

National professional societies

American Society of Spine Radiology, Practical Spine Imaging Symposium, Cancun, Mexico – 1 presentation, March 18-21.

Society of Neuroradiology, Symposium Neuroradiologicum, Philadelphia, PENN – 1 presentation, May 15-17.

American Heart Association Sunday Morning Program Scientific Sessions, Dallas, TX – 1 presentation, November 8.

Regional professional societies

Los Angeles Radiological Society, Los Angeles, CA – 5 presentations, January 16-18.

Orange County and Inland Neuroradiology Club Meeting, Orange, CA – 1 presentation, March 4.

Visiting professorships

University of California Irvine, CA, Grand Rounds, 1/21

**1999**

International symposia

Radiology in Beaujolais, Beaujolais, France – 5 presentations, September 20-24.

Radiological Society of North America, Chicago, IL – 2 presentations, November 29-30.

Postgraduate courses

Advances in Imaging: 1999, Park City, UT – 5 presentations, February 14-19.

Intermountain Imaging Conference, Deer Valley, UT – 5 presentations, February 28-March 5.

9<sup>th</sup> Annual Snowmass 1999: MRI in Clinical Practice, Snowmass, CO–3 presentations, March 14-19

Clinical Essentials of CT & MRI, Atlanta, Georgia – 5 presentations, April 22-25.

MRI 1999 – National Symposium, Las Vegas, NV – 1 presentation, May 6

Clinical Essentials of CT & MRI, Chicago, Illinois – 4 presentations, October 29-31.

CT/MRI Head to Toe, New York, New York – 4 presentations, Dec. 13-18.

National professional societies

American Society of Neuroradiology, San Diego, CA – 2 sessions, 5/25

Regional professional societies

Los Angeles Radiological Society, Pasadena, CA – 4 presentations, January 22-24.

Hoag Imaging - Irvine, CA, Uterine Artery Embolization Educational Lecture, 5/19

Hoag Aliso Viejo – Aliso Viejo, CA, Uterine Artery Embolization Educational Lecture, 10/14

Visiting professorships

Cleveland Clinic, OH, Neuro Board Review, 4/26.

Women's Health Conference – Newport Beach, CA, - 1 presentation, 11/18.

**2000**

International symposia

STAR Bangkok, Bangkok, Thailand – 4 presentations, January 20-21.

Radiology in Jordan, Amman, Jordan – 5 presentations, May 1-7.

CT Scientific User Conference, Zurich, Germany - 1 presentation, 6/16

Interamerican Congress of Radiology, Buenos Aires, Argentina- 1 presentation, 9/5.

Radiological Society of North America, Chicago, IL- 3 presentations, 11/27, 11/30, 12/1.

Postgraduate courses

Clinical Essential of CT & MRI, Las Vegas, Nevada – 3 presentations, 3/24

Symposium on Vascular Interventions, Las Vegas, Nevada - 3 presentations, Sept. 14-15

Symposium on Vascular Interventions, Las Vegas, NV- 2 presentations, July 14-15.

Clinical Essentials of CT & MRI, Atlanta, GA- 3 presentations, 10/27.



National professional societies

American Society of Spine Radiology, Marco Island, Florida – 2 presentations, February 21-23.

American Society of Neuroradiology, Atlanta, Georgia – 1 presentation, April 3-4

Regional professional societies

Los Angeles Radiological Society Spine Imaging Symposium, Beverly Hills, CA-1 presentation 11/11

Visiting professorships

New York University, NY Grand Rounds, June 2000

**2001**

International symposia

Radiological Society of North America, Chicago, IL - 4 presentations - 11/29-30

Postgraduate courses

Practical Radiology at Whistler, Whistler, BC - 2 presentations - 2/15

Harvard MRI 2001 Clinical Updates and Advanced Applications, Kauai, HI - 4 presentations - 2/21

Steamboat 2001: MRI: Basics to Advanced / What You Need to Know, Steamboat Springs, CO - 3 presentations - 3/2

Clinical Essentials of CT & MRI, Las Vegas, NV - 3 presentations - 5/4

Magnetic Resonance Imaging 2001, Las Vegas, NV - 4 presentations - 5/8

Screening CT: Concepts and Strategies, Newport Beach, Ca - 1 presentation - 9/8

Clinical Essentials of CT & MRI, Scottsdale, AZ - 5 presentations - 10/26

CT Screening: The Science; The Business; The Issues, New York, NY - 3 presentations - 12/14-16

Regional professional societies

Western Neuroradiological Society-Santa Barbara, CA - 2 presentations

**2002**

International symposia

27<sup>th</sup> Symposium Neuroradiologicum, Paris France, 1 presentation 8/20

Radiological Society of North America, Chicago, IL, 4 presentations 12/1-12/5

Brazilian Radiological Society STAR program, Sao Paulo, Brazil 3 presentations 10/25

Radiological Society of North America, Chicago, IL, 5 presentations 2/3

Postgraduate courses

Advanced MR Imaging Techniques, Las Vegas, NV, presentation 2/10

Barrow Neurological Institute 28<sup>th</sup> Annual Symposium, Phoenix, AZ 2 presentations 3/2

CT Screening: Concepts and Strategies, Atlanta, GA 4 presentations 3/9-10

Clinical Essentials of CT & MRI, Las Vegas, NV, 2 presentations 4/29-30

Multi-Slice Helical CT: Basics to Advanced, Las Vegas, NV 4 presentations 5/10-11

4<sup>th</sup> Annual Symposium on Multi-Detector Row CT, San Francisco, CA, 1 presentation 6/23

CT in Early Disease Detection (Screening): Strategy, Efficacy, Technique – 3 presentations - 10/4-6

National professional societies

American Society of Neuroradiology 40<sup>th</sup> Annual Meeting, Vancouver, CA - 1 presentation - 5/14

Regional professional societies

Orange County Radiological Society, Santa Ana, CA - 1 presentation - 1/31

Hoag Heart & Vascular Institute Endovascular Summit Course -11/8

**2003**

Regional Professional Societies

Los Angeles Radiological Society 5<sup>th</sup> Annual Midwinter Radiology Conference, Los Angeles, CA - 2 presentations 2/1-2/2

San Francisco Bay Radiological Society, San Francisco, Ca, 1 presentation 4/8

Pacific Northwest Radiological Society, Portland, OR 2 presentations, 4/26

California Radiological Society, Newport Beach, Ca 1 presentation, 9/20

Postgraduate courses

3<sup>rd</sup> Annual Vail Conference: New Advances in MR & CT, Vail, CO-3 presentations 2/6-2/7

Practical Radiology at Whistler, Whistler, BC- 1 presentation 2/12

Wesley Medical Center, Grand Rounds, Wichita Kansas-2 presentations 3/11

California Pacific Medical Center, Grand Rounds, 1 presentation 4/8

Clinical Essentials of CT & MRI, Las Vegas, NV, 3 presentations 4/25

Current Issues of MRI in Orthopedics and Sports Medicine, San Francisco, CA - 3 presentations - 8/26-8/27

National professional societies

American Society of Neuroradiology 41<sup>st</sup> Annual meeting, Washington, D.C., 2 present 4/28-4/30

**2004**

Regional Professional Societies

Hoag Heart & Vascular Institute Endovascular Summit, Newport Beach, CA - 2 presentations - 1/15

Beech Street Corporation-Coronary Artery Disease, Lake Forest, CA - 2/18

Hoag Hospital ECU Paramedics lecture - Stroke: Principles of Imaging, Newport Beach, CA - 3/19

Postgraduate courses

Practical Radiology at Whistler. Whistler, BC - 1 presentation - 2/11  
Multislice Helical CT: Basics to Advanced, Las Vegas, NV - 4 presentations - 4/16  
Clinical Essentials of CT & MRI, Las Vegas, NV - 4 presentations - 5/13  
Bare Bones Radiology Conference 6<sup>th</sup> Annual, Modesto, CA - 2 presentations - 10/23  
UCSD Postgraduate Radiology Course 29<sup>th</sup> Annual, San Diego, CA - 3 presentations - 10/27-10/29  
National Tutorial on Stroke, Washington, DC - 3 presentations - 11/12-13

National professional societies

Society of Interventional Radiology 2004 Annual meeting, Phoenix, AZ - 1 presentation - 3/29  
American College of Radiology, Arkansas Chapter, Little Rock, AR - 4 presentations - 4/17  
American Society of Neuroradiology 42<sup>nd</sup> Annual meeting, Seattle, WA - 2 presentations - 6/8 & 6/10

International Symposia

Polish Congress of Radiology, Honorary Guest, Warsaw, Poland - 2 presentations - 6/16-19  
Radiological Society of North America, Chicago, IL - 5 presentations - 11/27-12/2

Visiting Professorships

Harborview Medical Center Grand Rounds, Seattle, WA - 3/17

**2005**

Regional Professional Societies

Hoag Heart & Vascular Institute Endovascular Summit, Newport Bch, CA - 4 presentations - 1/13-14  
Kaiser Permanente Annual Radiology Symposium, Garden Grove, CA - 2 presentations - 10/1  
Hoag ACME Education Fall Symposium, Newport Beach, CA - 1 presentation - 10/22  
A Review of MRI of the Brain and Spine for Neurologists, Nashville, TN - 2 presentations - 11/5

Postgraduate Courses

Practical Radiology at Whistler, Whistler, BC - 1 presentation - 2/7  
Clinical Essentials of CT & MRI, Las Vegas, NV - 3 presentations 4/6-9  
Western Stroke symposium: What's New in Prevention, Diagnosis and Therapy, Newport Beach, CA  
Course Organizer - 4 presentations - 4/15-17  
Issues in Aging Congress, New Orleans, LA - 1 presentation - 7/16  
Musculoskeletal & Neuroradiology MR Review, Vancouver, B.C. - 4 presentations - 8/21  
UCSD Postgraduate Radiology Course 30<sup>th</sup> Annual, San Diego, CA - 3 presentations - 10/28

Visiting Professorships

Annenberg Center for Health Sciences at Eisenhower Grand Rounds, Rancho Mirage, CA - 4/21  
UCI Medical Center, Dept of Neurology Grand Rounds, Orange, CA - 8/24

International Symposia

CT: Radiology's Powerhouse, Berlin, Germany - 1 presentation - 6/10  
Radiological Society of North America, Chicago, IL - 2 presentations - 11/26-12/1

**2006**

Regional Professional Societies

Orange County Radiological Society, Orange, CA - 2 presentations - 1/31  
Hoag Hospital To Your Health Neuroscience Lecture, Newport Beach, CA - 11/15

Postgraduate Courses

Economics Summit: Strategies for Successful Radiology Practices in the 21<sup>st</sup> Century, Las Vegas, NV - 4 presentations - 4/21-22  
National Tutorial on Stroke, Atlanta, GA - 3 presentations - 5/5-7  
Radiology After Five 4<sup>th</sup> Annual, Las Vegas, NV - 4 presentations - 10/8  
Economics of Diagnostic Imaging, National Symposia, Arlington, VA - 3 presentations - 10/27-28

UCSD Postgraduate Radiology Course 31<sup>st</sup> Annual, San Diego, CA - 8 presentations - 11/2-3

Visiting Professorships

Pomona Valley Hospital Medical Center Grand Rounds, Pomona, CA - 7/25  
Torrance Memorial Medical Center Grand Rounds, Torrance, CA - 8/9  
San Antonio Community Hospital Grand Rounds, Upland, CA - 11/9

International Symposia

Radiological Society of North America, Chicago, IL - 4 presentations - 11/26-30

**2007**

International Symposia

European Congress of Radiology, Vienna, Austria - 1 presentation - 3/9  
International Society for Magnetic Resonance in Medicine, Berlin, Germany - 1 presentation - 5/20  
Radiological Society of North America, Chicago, IL - 3 presentations - 11/24-29

Postgraduate Courses

Clinical Advances in Multi-Slice/Multi-Channel CT & CTA, Las Vegas, NV - 4 presentations - 4/14  
Western Stroke Symposium, Newport Beach, CA - 5 presentations - 6/1-3  
Radiology After Five 5<sup>th</sup> Annual, Las Vegas, NV - 4 presentations - 9/8

UCSD 32<sup>nd</sup> Annual Postgraduate Radiology Course, San Diego, CA – 8 presentations – 10/29  
Regional Professional Societies  
Hoag 6<sup>th</sup> Annual Endovascular Summit, Newport Beach, CA - 1 presentation – 5/10  
Hoag Community Education Lecture, Newport Beach, CA – 1 presentation – 5/31  
Western Neuroradiological Society, Vancouver, BC, Canada – 2 presentations – 10/7  
Hoag International Valve symposium, Huntington Beach, CA – 1 presentation – 10/18  
National Professional Societies  
American Society of Neuroradiology 45<sup>th</sup> Annual Meeting, Chicago, IL – 1 presentation – 6/13  
Visiting Professorships  
The Queens Medical Center Grand Rounds, Honolulu, HI – 7/23

**2008**

Postgraduate Courses  
Los Angeles Radiologic Society (LARS), Universal City, CA – 1 presentation – 1/27  
CT & MR Imaging Course, Las Vegas, NV – 5 presentations – 4/11  
Florida Radiological Society Annual Meeting, Orlando, FL – 1 presentation – 7/12  
17<sup>th</sup> Annual Current Issues in MRI & Sports Medicine, San Francisco, CA – 1 presentation – 8/24  
Neuroradiology in Clinical Practice, Las Vegas, NV – 3 presentations – 9/13  
UCSD 33<sup>rd</sup> Annual Postgraduate Radiology Course, San Diego, CA – 6 presentations – 10/30  
Visiting Professorships  
New York Hospital-Cornell Medical Center Grand Rounds, New York, NY – 1 presentation – 2/4  
Regional Professional Societies  
Hoag Community Education Lecture, Newport Beach, CA – 1 presentation – 3/19  
Patient Lecture: How to Read Your MRI, Laguna Woods, CA – 1 presentation – 3/25  
Hoag Community Education Lecture, Newport Beach, CA – 1 presentation – 5/27  
Hoag ACME Educational Symposium, Newport Beach, CA – 2 presentations – 6/21  
Hoag Annual Endovascular Summit, Newport Beach, CA - 1 presentation – 8/2  
Hoag Neuroscience Nursing Conference, Newport Beach, CA 1 presentation – 9/15  
California Radiological Society – Newport Beach, CA – 3 presentations – 10/18  
International Symposia  
International Diagnostic Course in Davos, Switzerland – 10 presentations – 3/31-4/4  
Radiological Society of North America, Chicago, IL - 3 presentations - 11/30-12/2  
National Professional Societies  
American Society of Neuroradiology 46<sup>th</sup> Annual Meeting, Chicago, IL – 2 presentations – 6/1-4  
American College of Radiology Group Practice Leaders' Meeting – Marina del Rey, CA – 1 presentation – 11/2

**2009**

Postgraduate Courses  
Los Angeles Radiologic Society (LARS), Universal City, CA – 3 presentations – 1/24  
26<sup>th</sup> Annual MRI: National Symposium, Las Vegas, NV – 4 presentations – 3/30  
Advances in MR & Breast Imaging 2009, Dana Point, CA – 4 presentations – 11/5-6  
MRI of the Brain 2009, Austell, GA – 5 presentations – 11/7-8  
National Professional Societies  
American Society of Neuroradiology 47<sup>th</sup> Annual Meeting, Vancouver, BC, Canada – 1 presentation – 5/19  
American College of Radiology Practice Leaders Meeting, Chicago, IL – 1 presentation – 10/11  
ACR-Radiology Business Management Association – Reston, VA – 1 presentation – 11/14  
Regional Professional Societies  
Patient Lecture: How to Read Your MRI, Laguna Woods, CA – 1 presentation – 5/28  
Kaiser Permanente Annual Radiology Symposium, Universal City, CA – 2 presentations - 5/30  
Hoag Annual Endovascular Summit, Newport Beach, CA - 1 presentation – 8/7  
International Symposia  
ISMRM Weekend Case-Based Clinical Educational Course – Los Angeles, CA – 1 presentation 9/13  
Radiological Society of North America, Chicago, IL - 4 presentations - 11/29-12/3

**2010**

Regional Professional Societies  
Hoag Neurosciences Symposium, Newport Beach, CA – 1 presentation – 1/16  
Lakeview Senior Center Presentation – 4/5  
CA Radiological Society Annual Meeting – San Francisco, CA – 1 presentation – 10/2  
UCSF Annual Newton Lecture & Grand Rounds – San Francisco, CA – 2 presentations – 10/13  
National Professional Societies  
American Heart Association Get With the Guidelines Heart & Stroke Workshop, Newport Beach, CA  
1 presentation – 1/29  
American Society of Neuroradiology 48<sup>th</sup> Annual Meeting, Boston, MA – 1 presentation – 5/16

Postgraduate Courses

Multislice CT in Clinical Practice, Vail, CO – 4 presentations – 2/8-12  
 5<sup>th</sup> Annual Economics Summit: Strategies for Successful Radiology Practices in the 21st Century, Las Vegas, NV – 3 presentations – 4/16-17  
 Masters Diagnostic Radiology Symposium, Battery Park, NY – 5 presentations – 4/22-25  
 Neuroradiology in Clinical Practice, Las Vegas, NV – 4 presentations – 9/24-25  
 Annual Economics of Diagnostic Imaging – Arlington, VA – 3 presentations – 10/30-31  
International Symposia  
 European Congress of Radiology Wilhelm Conrad Rontgen Honorary Lecture, Vienna, Austria – 1 presentation – 3/5  
 XIX Symposium Neuroradiologicum – Bologna, Italy – 2 presentations – 10/7-8  
 Radiological Society of North America, Chicago, IL - 3 presentations - 11/28-12/2

**2011**

Regional Professional Societies

Hoag Grand Rounds, Newport Beach, CA – 1 presentation – 1/21  
 Hoag Neurosciences Symposium, Newport Beach, CA – 1 presentation – 3/12

International Symposia

ISMRM Weekend Case-Based Clinical Educational Course – Los Angeles, CA – 1 presentation 3/27  
 15<sup>th</sup> Annual Advanced MRI Meeting, Graz, Austria – 7 presentations – 5/4-7

Postgraduate Courses

6<sup>th</sup> Annual Economics Summit: Strategies for Successful Radiology Practices in the 21st Century, Las Vegas, NV – 3 presentations – 4/8-9

Postgraduate Courses

Masters Diagnostic Radiology Symposium, Battery Park, NY – 5 presentations – 5/19-22

**POSTDOCTORAL FELLOWS SUPERVISED**

1980 - 1983 (CT-Ultrasound)	Leonora Fung, Margaret Simmons, Cliff Stamler, Geoffrey Chung, & John Rego
1980 - 6/83	Co-director of visiting fellowship in CT scanning at San Francisco General Hospital. Lectures and seminars with fellows (5 hours/week).
1983 - 1984	Steve Ostrov, William Kelly, Paul Badami, Murray Solomon, Lanning Houston, Gary Stimac, William Dillon, Jeremy McCreary, & David Haas
1984 - 1985	David Haas, Betsy Holland, Paul Harper, Keith McMurdo, Scott Rosenbloom, Walter Kucharczyk, Luis Lemme-Plaghos, & Isabelle Berry
1985 - 1986	Wallace Peck, Walter Olsen, Keith McMurdo, & Isabelle Berry
6/83 - 6/86	Co-director of visiting Fellowship in Neuroradiology at Moffitt-Long Hospitals. Lectures and seminars with fellows.
6/85 - 6/86	Co-Director of visiting Fellowship in Neuro Magnetic Resonance Imaging/UCSF.
1992-1993	Maureen Jensen
1993-1994	Andrew Kelly
1995-1996	Robin Kates

**RESEARCH/GRANTS AND CREATIVE ACTIVITY**

**RESEARCH PROJECTS (Brief outline)**

**Funded**

2010 UniHealth Foundation Grant: \$772,500  
 Orange County Vital Aging Program

Bayer GEMMA1 91743: An open-label, multicenter, phase 3 study with corresponding blinded image reading to determine the efficacy and safety of a single intravenous injection of

0.1mmol/kg body weight of gadobutrol 1.0 molar (Gadovist®) in patients with newly diagnosed breast cancer referred for contrast-enhanced breast MRI. Principal Investigator, Michael Brant-Zawadzki, MD

AMAG FER-PAD-001: A Phase II, Open Label, Randomized Multicenter Trial Comparing Noncontrast MRA versus Ferumoxytol Vascular-Enhanced MRI (VE-MRI) for the Detection of Clinically Significant Stenosis or Occlusion of the Aortoiliac and Superficial Femoral Arteries in Subjects with Peripheral Arterial Disease Scheduled for Digital Subtraction Angiography (DSA). Principal Investigator, Michael Brant-Zawadzki, MD

2009 Penumbra, Inc The START Trial (CLP 2480.C): Clinical Outcome in Acute Stroke Treatment after Imaging Guided Patient Selection for Interventional Revascularization Therapy.  
Michael Brant-Zawadzki, MD Principal Investigator  
Hoag Memorial Hospital Presbyterian, Newport Beach

Interventional Management of Stroke (IMS III): A Phase 3, Randomized, Multi-Center, Open Label, 900 Subject Clinical Trial that will examine whether a combined intravenous (IV) and intra-arterial (IA) approach to recanalization is superior to standard IV rt-PA (Activase®) alone when initiated within three hours of acute ischemic stroke onset. 2009  
David Brown, MD Principal Investigator  
Michael Brant-Zawadzki, MD Sub-Investigator  
Hoag Memorial Hospital Presbyterian, Newport Beach

2008 Siemens FLT101, "A Phase II/III, Open Label, Non-Randomized, Multi - Center Study Of Positron Emission Tomography (PET) Imaging with [F-18]FLT Compared to [F-18] FDG in Cancer Patients for Treatment Evaluation"  
Michael Brant-Zawadzki, Principal Investigator  
Hoag Memorial Hospital Presbyterian, Newport Beach

Penumbra Imaging Collaborative Study (PICS): A Multicenter Trial to Assess Outcome of Patients Revascularized by the Penumbra System™  
Michael Brant-Zawadzki, Principal Investigator  
Hoag Memorial Hospital Presbyterian, Newport Beach

CPDS-0701: A PHASE II, MULTICENTER, OPEN-LABEL, IMAGING STUDY INVESTIGATING THE EFFICACY AND SAFETY OF THREE DOSING REGIMENS OF XERECEPT® (CORTICORELIN ACETATE INJECTION); HUMAN CORTICOTROPIN RELEASING FACTOR (hCRF) FOR THE REDUCTION OF PERITUMORAL BRAIN EDEMA (PBE) IN PATIENTS WITH PRIMARY MALIGNANT OR METASTATIC BRAIN TUMORS HUMAN CORTICOTROPIN-RELEASING FACTOR (HCRF).  
Christopher Duma, Principal Investigator  
Michael Brant-Zawadzki, Sub-Investigator  
Hoag Memorial Hospital Presbyterian, Newport Beach

A multicenter, randomized, double-blind, crossover, phase 3 study to determine the safety and efficacy of gadobutrol 1.0 molar (Gadovist®) in patients referred for contrast-enhanced MRI of the central nervous system (CNS).  
Michael Brant-Zawadzki, Principal Investigator  
Hoag Memorial Hospital Presbyterian, Newport Beach

2002 Beckman Foundation Grant: \$2.5 million  
MR Directed Biopsy and In-situ RF Treatment of Breast Tumors  
Michael Brant-Zawadzki, Principal Investigator

2000 Autism: A Model of Anomalous Neural Systems Development  
Michael Brant-Zawadzki, Co-investigator 2000  
Pauline Filipek, Principal Investigator  
University of California, Irvine  
NIH Grant #HD35458 (\$96,000)

A Multi-national, Multi-center, Double-blind, Placebo Controlled Study to Evaluate the Efficacy, Tolerability and Safety of Glatiramer Acetate for Injection in Primary Multiple Sclerosis Patients  
Michael Brant-Zawadzki, Co-investigator  
Gaby Thai, Principal Investigator  
University of California, Irvine

NIH Grant #27998

Novartis Exelon Protocol CENA 713 1A07  
Duke University  
Michael Brant-Zawadzki, Co-investigator

- 1996-97      The Prospective Multicenter Dose-Ranging Study of Intra-Arterial Thrombolysis in Acute Middle Cerebral Artery Distribution Thromboembolic Stroke  
Michael Brant-Zawadzki, Co-investigator  
Abbott Laboratories
- The Effects of 500 mg Citicoline on the Evolution of Lesion Volume in Human Stroke Using Diffusion Weighted Magnetic Resonance Imaging.  
Michael Brant-Zawadzki, co-investigator  
Interneuron Pharmaceuticals, Inc.
- 1992-1993      An Open Phase III Trial of Gadodiamide Injection (Gd-DTPA-3MA) in Contrast Enhanced Magnetic Resonance Angiography of the Head & Neck in Adults.  
Michael Brant-Zawadzki, Co- Investigator  
Sterling Winthrop Pharmaceuticals
- 1992-1993      An Open Phase III Trial of Gadodiamide Injection (Gd-DTPA-3MA) in Contrast Enhanced Magnetic Resonance Angiography of the Renal and Peripheral Vasculature in Adults.  
Michael Brant-Zawadzki, Co- Investigator  
Sterling Winthrop Pharmaceuticals
- 1992            Evaluation of High Dose ProHance in Neurological Pathology: Comparison of 0.1 mmol/kg Magnevist to 0.3 mmol/kg ProHance  
Michael Brant-Zawadzki, Co-investigator  
Squibb Diagnostics
- 1991            Evaluation of Safety and Usefulness of Gadodiamide (0.3 mmol/kg) vs Magnevist (0.1 mmol/kg), Phase III. Michael Brant-Zawadzki, Co-Investigator.  
Sterling Research Group (\$137,500)
- 1990            Evaluation of a New Peripherally Positioned Port (Periport) in the Central Venous System for Vascular Access. Michael Brant-Zawadzki, Co-Principal Investigator. Infusaid, Inc., Norwood, MA.
- 1989-1990      Excimer Laser Angioplasty Systems for Treatment of Peripheral Vascular Disease, Phase II/III study. Co-Investigator, Advanced Interventional Systems, Inc.
- Coil Embolization for Neuroradiologic Indications Phase II/III, Co- Investigator, Target Therapeutics
- Coil Embolization for Non-Neuroradiologic Indications, Phase II/III, Co- Investigator, Target Therapeutics
- Multicenter Safety and Efficacy Evaluation of S-041 Injection - A contrast enhancing agent for use in conjunction with MRI of the central nervous system, Phase II/III, Co-Investigator, Salutar, Inc. (\$86,000)
- Embolization with Detachable Silicone Balloons Cerebral Applications, Phase II, Co-Investigator, Interventional Therapeutics Corporation
- Balloon Dilatation of Cerebral Vasospasm, Phase II, Co- Interventional Therapeutics Corporation
- Clinical Investigation of ProHance in Patients Suspected of Having Neurological Pathology, Phase III, Co-Investigator. Squibb Diagnostics
- (Phase 2) Radiofrequency Hot-Tip wire for peripheral vascular disease, Co-Investigator. Advanced Interventional Systems, Inc



1988 - 1989	Open Label Gadolinium DTPA/dimeglumine Protocol 202-13: MRI Enhancement Agent Human Compassionate Use for Brain Lesions and Spinal Cord Tumors. Michael Brant-Zawadzki, Co- Investigator Berlex Laboratories. (\$5000)
1987 - 1989	"Chemoembolization of Hepatic Tumors with Angiostat (Collagen Cross-linked) and Cis-Platinum - a Clinical Trial". Target Therapeutics. "Embolization of Brain Tumors and AVM's with Angiostat - a Clinical Trial". Michael Brant-Zawadzki - Co-Principal Investigator Target Therapeutics.
1985 - 1987	"Deep White Matter Lesions: Imaging and Cognitive Studies in the Aged". ROI NIH Grant. Michael Brant-Zawadzki - Co-investigator; 15% time and salary Fein, G., Van Dyke, C. - Principal Investigators; submitted July 1985. (\$1,292,510) Correlation of MR, CT, PET imaging of the aging brain with intellectual measurement.
1986 - 1987	"Effects of Calcium Channel Blockers on Cerebral Ischemia: An MRI/MRS Study" Michael Brant-Zawadzki, Principal Investigator Syntex Laboratories (\$20,000)
1985 - 1986	"Multicenter Study of Gadolinium DTPA as an MRI Contrast Agent" Michael Brant-Zawadzki, Co- Investigator Berlex Laboratories (\$100,000.)
1985 - 1987	"NMR Metabolic Studies of Regional Brain Ischemia" Michael Brant-Zawadzki, Co-investigator P. Weinstein, Principal Investigator NIH Grant #ROI NS22022-01 (Approx. \$360,000.)
1984 - 1986	"NMR Imaging and Spectroscopy in Experimental Edema Michael Brant-Zawadzki - Co-investigator 15% Time; Bartkowski, H. - Principal Investigator NIH Grant #ROI NS20368-01 (\$289,621.)
1983 - 1986	"Nitroxide Free-Radical Contrast - Media for NMR Imaging Michael Brant-Zawadzki - Co-investigator 20% Time; Brasch, R.C. - Principal Investigator - NIH Grant #I-ROI-AM31937-02 (\$546,000.)
1983 - 1984	"NMR and Subsecond CT Monitoring of Tissue Changes and Regional Blood Flow in Cats with Temporary MCA Occlusion" Michael Brant-Zawadzki - Principal Investigator: Academic Senate - UCSF Grant 2 - 505164-19900-3 (\$8,969.)
1982 -1983	"Brain Edema" Michael Brant-Zawadzki - Co-investigator; Pitts, L. - Principal Investigator NIH Grant: Clinical Research Center 2-P50-NS14543-045 (Subsection - Brain Edema: Clinical Studies).
<b><u>Non-funded</u></b>	Cordis Neurovascular, Inc. Cordis ENTERPRISE Vascular Reconstruction Device and Delivery System. HDE H060001, Principal Investigator 2007  Boston Scientific "Wingspan Stent System and Gateway PTA Balloon Catheter, A Humanitarian Use Device" HDE H050001, Principal Investigator 2006  Boston Scientific "Neuroform™ Microdelivery Stent System, A Humanitarian Use Device" HDE H020002, Principal Investigator 2003  Research and Development of Digital Angiography: Prototype Equipment  Research and Development of NMR imaging and spectroscopy of the central nervous



system, acute cerebral ischemia.

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# **EXHIBIT B**

### Materials Considered

1. U.S. Patent No. 5,560,360
2. File History for U.S. Patent No. 5,560,360
3. Claim Construction Order dated May 5, 2011
4. NeuroGrafix's Opening Claim Construction Brief, Exhibits, and Declarations dated February 11, 2011
5. Defendants' Responsive Claim Construction Brief, Exhibits, and Declarations dated February 25, 2011
6. NeuroGrafix's Reply Claim Construction Brief, Exhibits, and Declarations dated March 8, 2011
7. Defendants' Sur-Reply Claim Construction Brief, Exhibits, and Declarations dated March 17, 2011
8. Markman Hearing Transcript dated March 24, 2011
9. Transcript for February 8, 2011 Deposition of Michael E. Moseley
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